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SPECIFICATION FOR
SOUNDING SEXTANT

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SPECIFICATION FOR SOUNDING SEXTANT

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SPECIFICATION FOR SOUNDING SEXTANT

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 May 1969, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 The sounding sextant is used for plotting the position for the purposes of sounding rivers or estuaries and harbours.

0.3 This standard specifies the general and functional requirements of commonly used sounding sextants.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of a sounding sextant.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Arc — Graduated portion of the sextant which is attached to the frame.

2.2 Horizon Mirror — A mirror mounted rigidly on the frame opposite to the telescope.

2.3 Index Arm — Movable arm, one end of which is pivoted at the centre of curvature of the arc and the other end carries a device to facilitate reading of angles.

2.4 Index Mirror — A mirror mounted rigidly on the Index arm over its centre axis.

*Rules for rounding off numerical values (*revised*).

3. GENERAL REQUIREMENTS

3.1 The sextant shall be so designed as to obtain results within the accuracy specified.

3.2 The sextant shall be made from suitable light weight anticorrosive material so that the total weight of the sextant shall not exceed 1.3 kg.

3.3 The sextant shall be finished dull black and the graduations shall be in white.

3.4 The sextant shall withstand all climatic conditions including saline atmosphere.

3.5 A micrometer arrangement shall be provided for accurate reading of the arc graduations. The movement of the micrometer arrangement shall be even and smooth throughout the range and there shall be no backlash.

3.6 The index arm should be capable of being clamped at any position on the arc and of being given a slow motion to one side or the other by means of the micrometer drum. When clamped into position the engagement of the micrometer screw and constant thread rack should be satisfactory and without play. The clamp should be capable of being released for rapid movement of the index arm.

3.7 The arc shall be graduated in degrees from $h-5^{\circ}$ to $+140^{\circ}$, figured at intervals of every 5° and shall be so arranged that when the index mirror is parallel to the horizon mirror, the reference mark on the index arm should point to the zero of the graduated arc. All figures and graduations on the graduated arc shall be engraved. The graduation lines shall be of uniform length and width.

3.8 The frame including the arc should be rigid enough so as to retain its shape when a pressure of 5 kgf is exerted on it at any point.

3.9 The index arm shall move smoothly along the arc and its axis of rotation shall coincide with the centre of curvature of the graduated arc. The index arm shall have a window cut into it to expose not less than 24° of arc and shall bear the fiducial mark or index to pass over the graduated arc to indicate the degree position.

3.10 The telescope shall be rigidly mounted on the frame and shall not foul the index mirror or index arm during the latter's traverse along any part of the arc. The telescope shall be between 110 mm to 113 mm in length and project not more than 100 mm to 110 mm outside the mounting on the sextant frame.

3.11 A handle of suitable material giving a firm grip shall be rigidly attached to the frame for ease of handling the instrument while in use. The dimensions of the handle shall be such that it remains clear when the sextant is resting on its supports on a plane surface.

3.12 The sextant shall be fitted with supports, suitable for resting in either an upright or inverted manner on a table.

3.13 The supports shall be such that the movement of the index arm or field of view of the telescope or any path of light reflected by the index and horizon mirrors are unobstructed. The supports should be fitted with non-skid shoes.

3.14 The horizon and index mirrors shall be rigidly mounted in their respective positions. The horizon mirror shall be provided with arrangements for adjustment in the horizontal and vertical planes for the removal of side error and index error. The arrangements for adjustment should be by means of capstan headed screws fitted with screw cover caps. The index mirror should be fitted free from error of perpendicularity as far as possible and in any case not exceeding three minutes. Both horizon and index mirrors shall be mounted in circular or rectangular holders which shall be completely damp-proof.

3.15 Suitable filters capable of being clipped on to the eyepiece shall also be provided.

3.16 The radius of the arc shall be not less than 150 mm or more than 160 mm from the pivot to the trough of the worm rack.

3.17 A suitable padded carrying case, preferably water-tight, shall be provided for the sextant and its accessories. The weight of case shall not exceed 2 kg.

3.18 The case shall be so designed that the sextant may be fitted only in one position.

4. FUNCTIONAL REQUIREMENTS

4.1 The telescope shall be of terrestrial type having a minimum magnification of $5\times$, field of view 3° to 4° and object glass aperture of 45 mm.

4.2 The eyepiece shall be provided with a focusing arrangement and a dioptric scale marked for each dioptre up to six dioptries on each side of zero.

4.3 The telescope shall conform to the requirements stipulated in IS : 2754-1964*. It shall preferably be tropicalized.

4.4 The optical axis of the telescope when mounted shall be parallel to the plane of the arc. This axis shall pass through a point on the vertical radius in the upper half of the horizon mirror.

4.5 The length of the figured graduations shall be 4 mm and that of one degree graduations 3 mm.

4.6 The micrometer drum of a diameter not less than 35 mm shall be divided at intervals of one minute and numbered at every ten minutes. One complete revolution of the micrometer shall move the index arm by

*General requirements for optical instruments.

one degree over the graduated arc. The movement of the index arm shall be by a worm attached to the micrometer drum and revolving in a rack of constant thread. The worm of the micrometer screw shall be of sufficient length to engage with a number of teeth of the arc rack sufficient to cover about six degrees of the arc scale.

4.7 The index mirror shall either be circular or rectangular. In case of circular mirror, the diameter shall be not less than 55 mm and in case of rectangular mirror, the dimensions shall be not less than 55×40 mm. It shall be back-silvered and suitably protected from damage due to saline atmosphere.

4.8 The horizon mirror shall either be circular or rectangular. In case of circular mirror, the diameter shall be not less than 35 mm and in case of rectangular mirror, the dimensions shall be not less than 35×20 mm. It shall be back-silvered and suitably protected from damage due to saline atmosphere.

4.9 The reflectivity of the two mirrors shall not be less than 88 percent.

5. TESTS

5.1 Test for Telescope — The telescope shall be tested for its optical characteristics and performance as per IS : 2754-1964*.

5.2 Test for Mirrors — The mirrors shall be tested in accordance with 4.5 and 7 of IS : 988-1959†.

5.3 Test for Perpendicularity of Index Mirror to Plane of Arc — Set the index arm at a reading between 20° and 40° marks on the graduated arc. Hold the eye just above the plane of the arc and look obliquely into the right-hand side of the index mirror in such a way as to see a portion of the arc both directly and by reflection at the same time. If the index mirror is perpendicular to the plane of the arc, the image in the mirror will appear to form a continuous curve with the direct portion of the arc.

5.4 Test for the Perpendicularity of Horizon Mirror to Plane of Arc — Point the telescope to any well-defined object and move the index arm slowly back and forth over the zero of the graduated arc. The reflected image will be seen moving back and forth. If it passes exactly over the direct image, the horizon mirror is perpendicular to the plane of the arc.

5.5 Test of Parallelism of Horizon Mirror to Index Mirror — Set the sextant to read $0^\circ 0'$. Sight through the telescope a well-defined object. The direct and the reflected images shall coincide.

5.6 Test for Parallelism of Line of Sight — Place the sextant with its face upward on a table or some other firm and level support; point the telescope at some vertical surface about 20 feet away. Place two objects

*General requirements for optical instruments.

†General requirements for optical components.

of equal height on the extreme ends of the limb to serve as temporary sights. Sight across the top of these objects and mark a point when the line of sight strikes the vertical surface. Near this point mark another point where the line of sight through the telescope strikes the same surface. The difference in elevation between these two points should be equal to the difference in elevation between the axis of the telescope and the line across the top of the two temporary sights measured by the sextant.

5.7 Accuracy of the Instruments — The accuracy of scale markings shall be tested by measuring various angles by the sextant and comparing the same against a standard instrument. The readings should not vary by more than one minute from the actual value.

5.8 Climatic and Environmental Tests — These tests are type approval tests and shall be carried out only when agreed to between the manufacturer and the purchaser. These are not to be used in routine testing for performance of instruments during bulk production, although these may be used for control testing of batch samples by arrangement between the manufacturer and the purchaser. The tests shall be carried out in accordance with IS : 2352-1963*. The outline of test and degree of severity shall be as follows:

Cold test	— 10°C
Dry heat test	70°C
Damp heat test (accelerated)	50°C and 95 to 100 per cent relative humidity
Salt spray test	28 days

5.8.1 Vibration Test — The sextant in its case shall be subjected to 450 vibrations per minute with an amplitude of 3 mm, for a period of five minutes. The sextant shall be in correct adjustment after this test.

5.8.2 Drop Test — The sextant in its case shall be held in a horizontal position and dropped over from a height of 300 mm on to a 225 mm layer of sand contained in a box and covered with a cloth. The sextant shall be in correct adjustment after this test.

6. ACCESSORIES

6.1 The following accessories shall be provided with each instrument:

a) Oil bottle with spill proof arrangements	1
b) Pin for adjustment of mirror screws	1
c) Screw driver	1
d) Cleaning brush	1
e) Chamois leather 10 × 10 cm	1

*Procedure for basic climatic and durability tests for optical instruments.

f) Detachable legs	3
g) Filters	2

7. MARKING

7.1 Each sextant shall be legibly and indelibly marked with the name, initials or trade-mark of the manufacturer and the year of manufacture.

7.1.1 The sextant may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8. PACKING

8.1 The sextant shall be suitably packed in its case together with its accessories and an instruction booklet.